

TARGET OF THE YEAR: HYPERTENSION

After mass screening, what?

Dr. Walter Jones, a dermatologist in a large Midwest city, shares a medical problem with 23 million other Americans: He has hypertension. In addition, Dr. Jones (this is not his real name) has had a complication that fortunately does not afflict most of his fellow hypertensives, although it could happen to some of them. He suffered the distressing effects of hypertensive encephalopathy.

Twenty-five years ago, when he was a medical student, Walter Jones was diagnosed as having hypertension. But in those days there were no effective drugs in general use for treatment. For decades he had no symptoms, although his diastolic pressure ranged between 110 mm Hg and 120 mm Hg. During those years, Dr. Jones was worked up by a dozen or more internists, friends of his who were teaching at the three medical schools in his city. All of them diagnosed his hypertension, but none treated him, not even after effective medications had become available.

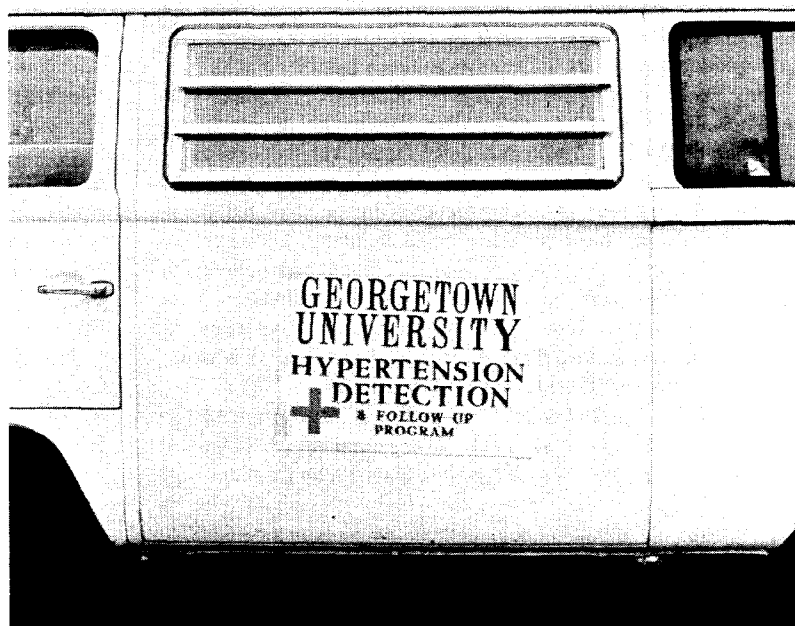
On a vacation trip last year, Dr. Jones suddenly developed symptoms of hypertensive encephalopathy. A leading cardiologist found that his diastolic pressure was 150 mm Hg. Then Dr. Jones finally received a prescription.

He went home and resumed his busy practice. During the next weeks the medication brought his pressure down, so he decided to try getting along without a chemical crutch. Within a short time, he had a stroke that caused cerebral deterioration. He is now back on medication, his blood pressure is down to 140/90 mm Hg, but the brain damage is irreversible.

Hard to believe? How could it happen to a physician? Dr. Jones' experience points up a continuing medical problem: Many physicians who recognize that drug therapy is beneficial in malignant or other severe or moderately severe hypertension do not believe in treating the much more common mild or moderate forms of the disease. Their belief has been anchored in tradition and sustained by the fact that, until recently, there was no proof that antihypertensive agents

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In Washington, D.C., paramedics make prescheduled home visits to identify hypertensives. Upon finding a candidate (right), they escort her to bus for ride to Georgetown clinic and further tests.



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could reduce morbidity and mortality rates. Since most patients with essential hypertension, which affects at least 85% of those with elevated pressure, are asymptomatic, doctors have often been loath to put them on life-long medication that might produce side effects such as potassium depletion, gastrointestinal disturbances, tiredness, depression, or impotence.

Nor, in recent years, have patients been flooding doctors' offices, clamoring to have their hypertension diagnosed and treated. In fact, of the estimated 23 million hypertensives in the U.S., only about half are aware of their condition, and only 10% to 20% are receiving effective treatment. Public ignorance and professional passivity have long combined to produce inaction against the disease that the American Heart Association says "probably represents the major health care challenge in the country today." Some physicians even refuse to tell patients that they have slightly elevated pressures, feeling that the resulting alarm is the surest way to cause hypertension.

Indeed, hypertension may be the nation's leading cause of death. Along with being responsible for the 60,000 deaths attributed each year to high blood pressure and hypertensive heart disease, it is a major underlying factor in the annual total of more than one million deaths from cardiovascular disease and strokes. The direct and indirect yearly cost to the nation was estimated at about \$5 billion in 1967, and it is certainly higher now.

Dr. Edward F. Freis, senior medical investigator of the VA, places chief blame for the toll on "the bulk of physicians who have remained unconvinced that the treatment of hypertension justifies the associated side effects, expense, and inconvenience." He also criticizes the tendency to put too much emphasis on curable forms of hypertension such as the renovascular type and those associated with pheochromocytoma, Cushing's syndrome, and certain other conditions, all of which account for less than 5% of the hypertensive population.

Another leading clinical investigator, Dr. John H. Laragh of Columbia University, says, "It's hard to change a doctor's mind when he's seen hypertensive patients for years, and nothing happened to them. What physicians are doing is falling back on their own gut feelings. There are patients with high blood pressure who live to a ripe old age. But every statistical study shows that hypertensives as a group don't live as long as normotensives, and they get strokes and heart attacks at a much faster rate."

Dr. Freis, in particular, has grounds for chiding colleagues, for it was he who nailed down the proof, in reports published in 1967 and 1970, that antihypertensive drugs can ward off complications and lengthen life. The classic VA cooperative study directed by Dr. Freis demonstrated that, in male patients with diastolic pressures of 105 mm Hg or higher, the risk of developing cardiovascular, cerebrovascular, or renal complications over a five-year period was reduced by a ratio of more than three to one by treatment, and deaths were also cut. For this work, Dr. Freis received the Lasker award in 1971.

The award marked a turning point. It brought into the fight against hypertension Mrs. Mary Lasker, president of the Albert and Mary Lasker Foundation, who in Washing-



New screening approaches include having blood pressure taken by (from left) a dental assistant, a high school student trained to make home visits, and a medical secretary using ultrasonic device.

ton bureaucratic battles has won victories for countless health causes. With her Washington chief of staff, Michael Gorman, director of the National Committee Against Mental Illness, Mrs. Lasker successfully laid siege to Elliot L. Richardson, then Secretary of HEW.

In July 1972, Secretary Richardson, acting on recommendations made by a conference of government and nongovernment agencies, launched the National High Blood Pressure Program—a campaign that is beginning to have great impact across the country this year. First he appointed two committees, the Hypertension Information and Education Advisory Committee and the Inter-Agency Working Group on High Blood Pressure. The latter brought together representatives of the NIH, the Health Services Administration, the FDA, and the VA. NIH was given the job of coordinating the program through the National Heart and Lung Institute (NHLI). Task forces were organized to make recommendations on criteria for screening, referral, and treatment; on educational programs for health professionals and for the public; and on resources required to carry out the program.

The campaign gained added momentum at a National Conference on High Blood Pressure Education, sponsored by HEW last January. By this time, the National High Blood Pressure Program had undergone a slight but significant semantic transmutation—its name was changed



to the National High Blood Pressure Education Program (NHBPEP). A special information center was set up within NHLI, and the program was given a \$2-million budget. At about the same time, Citizens for the Treatment of High Blood Pressure, Inc., came into being, with a former Richardson aide, Thomas P. Reutershan, as director, and Mrs. Lasker and Gorman on the board.

In his keynote address at the January conference, the then-HEW Secretary Richardson defined the federal government's role as that of a catalyst to spark the spread of information. The national program leans heavily on the initiative of individual physicians and medical organizations as well as hospitals, medical centers, pharmaceutical companies, industrial firms, and community groups. It also expects considerable help from the American Heart Association, which has made hypertension its first priority for the next three years and summoned its chapters and affiliates to provide troops for a far-reaching campaign.

A special AMA committee headed by Dr. Morton D. Bogdonoff, chairman of medicine at the University of Illinois and editor of the *Archives of Internal Medicine*, has recommended "prompt and vigorous therapy of hypertensive patients." Moreover, the committee urges "all physicians, irrespective of specialty, to routinely measure the blood pressure of every patient initially seeking care for any complaint." Special emphasis on hypertension is also

being planned by the American College of Cardiology through symposiums for practitioners and editorials and articles in the *American Journal of Cardiology*.

Medical schools are being asked to review their curriculums and make certain that future physicians are prepared to treat hypertension. Medical examining boards are being requested to do the same with their tests.

The man in charge of the national program, Dr. Theodore Cooper, director of NHLI, sees encouraging progress in the first year. "If you compare the amount of activity in high blood pressure awareness campaigns, screening efforts, television exposure, and books being published this year with that of previous years, there is a great difference. I was watching Channel 5 in Washington the other day. Several times it showed a spot urging people to have their blood pressures checked. You didn't see that before, and it's going on in many parts of the country." In the fall, millions watching the televised games of the National Football League will also be seeing spots with a pitch for having blood pressure measured.

Screening. Making a serious dent in the vast hypertension problem will obviously require massive efforts to identify unknowing millions of patients. Small hypertension screening projects, sometimes included in multiphasic health exams, have been under way in various communities for some time. One of the larger programs is the Chi-

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cago Heart Association Detection Project in Industry, which since 1967 has been screening employees for factors that increase their risk of coronary heart disease.

With the launching of the NHBPEP, screening has received heightened impetus. The most ambitious program has been sponsored by the Ciba Pharmaceutical Co., in cooperation with local heart associations and medical societies. Under the title of Community Hypertension Evaluation Clinics (CHEC), the program, started early this year, has now covered about 80 communities with two- or three-day screenings. The two largest CHEC campaigns so far were held in New Orleans, where 25,000 were screened, and in San Diego, where 41,000 were checked.

After being widely publicized in the press and on radio and TV, the screenings are conducted in shopping centers or schools (see cover). A few doctors and nurses and a large number of volunteers, including paramedics, constitute the personnel. People with elevated readings are referred to their own physicians or to local clinics. Of more than 125,000 screened so far, about 28% have been referred. This figure does not mean that one out of every four people screened has hypertension. Initial readings, especially under tense circumstances, are sometimes well above the person's usual range. It is up to the doctor consulted by the patient to determine whether the elevation is more than transitory. NHLI's Dr. Cooper estimates that only about half of those referred from screenings turn out to be confirmed hypertensives. In all communities, physicians are asked to provide feedback about patients who visit them as a result of the campaign.

"We've been trying to follow up on all 8,102 people who had high readings at our screening in April," says Dr. Stanley Garbus, who directed the New Orleans project for the Louisiana Heart Association. "There has been no great inundation of doctors and clinics, but we did hear from quite a few physicians that people who had been referred were showing up."

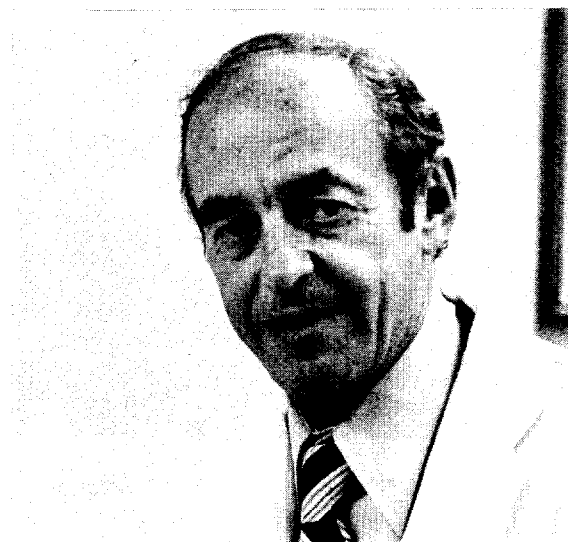
The next large CHEC screening is scheduled for September 7 and 8 in Montgomery, Ala. Another is planned in Baton Rouge, La., October 13 and 14. All told, 110 communities are expected to be covered this year, and the program will continue indefinitely.

Another major project that involves not only screening but also treatment is the national detection and follow-up program sponsored by the NHLI in 14 communities: Atlanta; Baltimore; Evans County, Ga.; Jackson, Miss.; Lansing, Mich.; Los Angeles; Minneapolis; Salt Lake City; and Washington, D.C. This will be a five-year study of 10,500 hypertensive men and women, with a high proportion of blacks. Begun in February, it had screened 51,000 people ranging in age from 30 to 69 by the end of June.

Persons with a diastolic pressure over 95 mm Hg, determined by averaging several readings, are asked to come to a clinic for a recheck. There, blood pressure is taken six times, and if it averages above 90 mm Hg, the person is asked to participate in the program and go through a thorough physical examination and lab tests. In each community, the hypertensives are then divided into two groups. Half are assigned to what is called the stepped-care program, a systematic treatment plan that starts



Dr. Finnerty: 'The biggest problems are keeping people under medical care and gaining compliance.'



Dr. Freis: 'I don't think it really matters what works—pills or diet—as long as something does.'



Dr. Laragh: 'Renin activity levels may provide a guide to selective and more rational therapy.'

with a single drug—a diuretic—and steps up the therapy if necessary. The other half are assigned to a community source of medical care, which could be a patient's own doctor or clinic. The first group are treated at the program's clinic, and each patient is seen at least every two months in the first year and later at least every four months. The second group will be visited annually and will be asked to come to the clinic for a checkup every two years.

"What we're trying to find out," says Dr. Gerald H. Payne, NHLI scientific project officer for the study, "is whether this type of stepped-care treatment results in any benefit as compared with the mixed therapies that prevail in the community. We'll look for differences in the occurrence of enlarged hearts, heart attacks, and strokes, and in the death rates of the two groups."

Manpower. There are obviously not enough primary physicians to provide screening, therapy, and follow-up for all hypertensives or even for a substantial number of those not now under treatment. However, one untapped reservoir of potential screeners consists of the many physician-specialists who do not give primary care. An effort is being made by the AMA and the Hypertension Information and Education Advisory Committee to get all of them to take their patients' blood pressures routinely and refer those with elevated readings.

Striking proof that even in hospitals the checking of blood pressure is often neglected has been provided by a leading hypertension specialist, Dr. Frank A. Finnerty Jr. of Georgetown University. He recently had a nurse circulate from ward to ward in a large Washington, D.C., city hospital, taking blood pressures of patients who were not on the medical or obstetrical services. Of the 1,300 recorded pressures, 400 were over 150/100 mm Hg; only 115 of these patients knew they were hypertensive, and only eight were getting treatment.

Georgetown University and the District of Columbia Heart Association have now joined in a project to train high school students wanting summer jobs to measure blood pressure in hospital clinics where it is not done routinely. The national program's advisory committee has proposed that every hospital and patient care institution make a major commitment to assure that all hypertensives are identified and receive appropriate treatment.

Another untapped reservoir of potential screeners is the nation's 121,000 dentists and their auxiliary personnel. The Bergen County, N.J., Dental Society and Fairleigh Dickinson University School of Dentistry have issued a brochure urging all dentists to have their assistants take patients' blood pressures. When the reading is elevated, the dentist himself is asked to call the patient's doctor.

An expanded role for specially educated nurses has been proposed by the American Heart Association. These nurses would "act as primary care practitioners in the area of hypertension," and would "take the initial history, follow the therapeutic regimen, and evaluate the progression of the illness." A trend in this direction is already under way, reports Dr. Finnerty. His own university's school of nursing has a new program for educating nurse-specialists, the first of whom will graduate in 1974. In the past year, the VA's Dr. Freis in Washington and Dr. Jo-

seph A. Wilber in Atlanta have similarly been training nurses to operate hypertension clinics.

Also required will be much wider reliance on physicians' assistants and other paramedics. Increased training of health aides is high among the recommendations of the national program's advisory committee. Notable situations where they are already being used include the ambulatory care project at Boston's Beth Israel Hospital, the Automated Military Outpatient System at DeWitt Army Hospital, Fort Belvoir, Va., and Dr. Finnerty's hypertension clinic at D.C. General Hospital.

"The only way we are ever going to handle the huge hypertension problem," says the Washington cardiologist, "is to have it taken care of largely by paramedical people. Our clinic in inner-city Washington is paramedically run, nurse-supervised, and has a doctor for consultation. Each patient is examined by the doctor the first time and put on a set program. Once the patient reaches a status-quo situation, which usually is fairly quickly because most have mild to moderate disease, he is seen on each following visit by the same paramedic, who talks about the disease and educates and motivates the patient." With this approach and drastically reduced waiting time, Dr. Finnerty says the clinic's dropout rate has been cut from 42% to 8%.

None of the proposals for using paramedics dispenses with the doctor as leader of the health care team. It is he who evaluates and prescribes, and it is he who is consulted when any problem arises, proponents emphasize.

Blacks. In the 14th century, the black plague devastated the white population of Europe. In the 20th, hypertension is the plague of blacks in the U.S. It is unquestionably the leading cause of death among them. (For every black who dies of sickle cell disease, 100 die from hypertension.)

Studies indicate that the disease is at least twice as common among blacks as among whites and tends to be more severe. The National Health Survey of 1960-1962 found that hypertensive heart disease was three times more prevalent among black males and more than twice as frequent among black females as among their white counterparts. Both hereditary and environmental factors are thought to be responsible. In the case of American blacks, most of whose ancestors came from West Africa where hypertension is widespread, the genetic components may be particularly strong.

There is also clear evidence among both blacks and whites of a familial predisposition. Says cardiologist Hazel M. Swann, chairman of the hypertension commission of the predominantly black National Medical Association: "In my family, all women develop hypertension at about age 45." And she adds with a wry laugh: "I have six years to go." Dr. Swann, who is director of professional standards in the Bureau of Community Health in HEW's Health Services Administration, believes the chief factor in the prevalence of hypertension among blacks is genetic but indicts a diet high in salt and fat as a second factor.

Under Dr. Swann's leadership, the NMA is actively participating in the NHBPEP with primary emphasis on "making the campaign relevant to blacks." Two-day workshops devoted to hypertension preceded the organization's annual meeting in New York earlier this month.

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Videotapes of the sessions will be made available, together with visiting consultants, to NMA constituent societies. Next January, the NMA plans to hold national hearings in Washington, D.C., on hypertension among blacks and send recommendations to the White House.

Diagnosis. Because emotional or environmental factors can cause blood pressure to fluctuate, most specialists suggest that the average pressure on three successive visits be the criterion. At what point does hypertension begin? This is almost like asking how high is "up." The eminent British authority, Sir George Pickering, argues that there is no dividing line between normotension and hypertension. He maintains that high blood pressure is unique in being a quantitative rather than a qualitative disease. Insurance company statistics support his thesis in showing that, even within the so-called normal range, those with a lower diastolic pressure live longer than those with a

higher one, and the same is true of the systolic pressure.

The "quantitative" concept has not met with universal acceptance among the experts, however. Columbia's Dr. Laragh, for one, believes it wipes out the distinction between normal and abnormal. Moreover, his own studies show that "essential hypertensives can have an equal degree of high blood pressure, but some have low renin levels, while others have normal and high renin levels. We believe this means that different mechanisms are at work and that these three groups of patients are not similar." They may thus require different management.

In any event, even Sir George suggests a diastolic level—95 mm Hg in men, 105 mm Hg in women—at which treatment should begin. The international standard adopted by WHO has been 160/95 mm Hg. But, in this country, there has been a trend toward lowering the "dividing line" to 140/90 mm Hg.

POSSIBLE MANPOWER SOLUTION: AN ELECTRONIC 'COLLEAGUE'

Can a computer be "taught" to diagnose and treat hypertension? Dr. Fredric L. Coe, director of the renal division at Chicago's Michael Reese Hospital and Medical Center, is now conducting an unusual study that he believes will show that the machine can do the job as well as a doctor—or perhaps even better. If he succeeds, his computerized system should help to solve the problem of the greatly increased patient load that is expected to accrue from the National High Blood Pressure Education program. Moreover, he believes that the system could be operated by paramedics under physician supervision.

On July 1, Dr. Coe and his associates, Drs. Suzanne Oparil and Theodore N. Pullman, began a long-term study that will compare computer diagnosis and treatment with the performance of specialists. The first phase of the study will run until the end of the year and include about 400 patients, 50% of whom are being randomly assigned to the computer and the others to physician management. They are being treated at clinics at Michael Reese Hospital and at the University of Chicago.

At the outset, a physician gives each patient a physical examination and orders various laboratory tests. Blood pressure is measured with an automatic instrument called the Ar-

teriosonde 1216, which utilizes ultrasound and is manufactured by Hoffmann-LaRoche. Data from the physical exams, lab tests, and pressure readings of half the patients are fed into an IBM360-65 computer that has been intricately programmed to respond to a great variety of information. Within a few minutes, a printout of recommendations appears. For a new patient, the computer suggests two additional visits so that the average blood pressure can be determined. When treatment is indicated, the machine, which is leased on a part-time basis, recommends a specific drug and dosage. The data and recommendations are entered on a chart that goes to the patient's doctor. He can sign the prescription the computer printed or rewrite it.

In the present phase of the study, the computer's pharmacopeia is limited to the thiazide diuretics (for

which furosemide can be substituted), methyldopa, hydralazine, and guanethidine. In a later phase, reserpine and propranolol will be added. If the blood pressure of a patient under treatment is not controlled after two visits, the computer will increase the dosage. When the pressure remains recalcitrant, the machine will add another drug or suggest a more potent one. The program relies on nurses to recognize side effects.

How do doctors feel about competition from an electronic "colleague"? So far, the program is being well accepted by physicians at both clinics, reports Dr. Coe, who is associate professor of medicine at the University of Chicago. He emphasizes, however, that the computer system is experimental and that a long-term study will be necessary to determine its feasibility for widespread use.



Dr. Coe hopes computer can expedite patient care at Michael Reese clinic.

The VA study included men with diastolic pressures averaging 90 mm Hg or higher. Effectiveness of treatment was clear-cut in patients with pressures above 104 mm Hg, less conclusive in those with lower pressures. This VA finding has led to the now widely accepted dictum that all patients with diastolic readings over 104 mm Hg should be treated. The question of whether those with lower pressures require therapy is still in dispute. Some experts, the VA's Dr. Freis among them, feel that the answer depends on other factors in the patient's life and that if the doctor decides against treatment, he should nevertheless keep the patient under observation.

Dr. Freis has devised a simple scoring system that many doctors find helpful. For patients with diastolic pressures of 90 mm Hg to 104 mm Hg, he suggests that one point should be scored for each of the following items in the history: age below 50, male sex (males are nearly twice as susceptible as females), black color, diastolic readings that are all 95 mm Hg or higher, target organ damage, and a major hypertensive complication in a parent. The physician should treat a patient in the 100 mm Hg to 104 mm Hg range, says Dr. Freis, if the score is one or more; in the 95 mm Hg to 99 mm Hg range if the score is two or more; and in the 90 mm Hg to 94 mm Hg range if the score adds up to three or more.

The Hypertension Information and Education Advisory Committee has simplified the problem, as well as gone counter to some expert opinion, by deciding to adopt the 160/95 mm Hg standard. "The lower you set it," explains Dr. John Stokes, the NHLI staffer who serves as executive secretary for the national program, "the more false-positives you get. You also may overload the health care system."

The national program's recommendations accept the criterion that a diastolic pressure over 104 mm Hg requires therapy, while treatment of the 95 mm Hg to 104 mm Hg range should be at the doctor's discretion in light of other factors. They also state that any patient with a diastolic pressure of 120 mm Hg should be referred immediately and that a patient whose diastolic reading hits 140 mm Hg or more should be hospitalized.

The advisory committee recommends as essential before starting therapy performing the following tests: ECG, BUN or creatinine, blood glucose, serum potassium, serum cholesterol, and urinalysis for protein, glucose, and hemoglobin. A second line of tests, considered less urgent, includes a chest x-ray, microscopic urinalysis, and serum uric acid. The IV pyelogram is regarded as of limited usefulness for most patients and reserved for evaluating difficult cases.

Therapy. In the days before effective antihypertensive agents were developed, dietary restriction with low salt intake was the principal therapy. Today most specialists rely on the battery of drugs now available. However, a leading cardiologist, Dr. George E. Burch, chief of medicine at Tulane University, re-emphasized the virtues of dietary management during a lively hypertension symposium at this year's AMA convention, which demonstrated some of the differences of opinion that still exist concerning therapy. "I think diet is extremely important,"

he said. "I put all my patients on a largely fruit and vegetable diet and take them off heavy beef and pork completely as well as off highly salty food. I don't put them on a low-salt diet unless they develop malignant hypertension or renal disease, but I do prescribe a low-cholesterol diet." Dr. Burch added that patients whose blood pressures fail to respond adequately to diet are given drug therapy, but diet should be tried first.

Dr. Finnerty strongly disagreed. "The biggest problem we have is how to keep people under medical care and how to increase compliance, since most people with mild to moderate disease feel fine. The worst way to get them to comply is to restrict their diets. Not that it isn't important, especially if there is azotemia or significant disease.



Dr. Cooper: 'Simply bringing 10% more patients each year under effective management and full compliance would constitute significant progress.'

But if you can get the patient to take a pill a day and stay under care, you're doing a very good job."

Dr. Ray W. Gifford Jr., director of the hypertension and nephrology department of the Cleveland Clinic, suggested that diet should "fit the occasion." An obese patient should reduce, a diabetic should be on restricted carbohydrates, and a patient with congestive heart failure should be on a salt-free diet. But for hypertensive patients without problems of this type, he says, "I make diet the last approach. I don't say anything about salt in the diet until I find out they're not responding to a diuretic or a diuretic plus whatever else I'm using. The average diuretic—say, a gram of chlorothiazide or its equivalent—will get rid of 8 gm to 10 gm of salt in the diet."

Dr. Freis, who has contributed greatly to the development of antihypertensive drug therapy, took a pragmatic stance: "I don't think it really matters what works as long as something does. If diet works for one individual, let it

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be diet; if pills work for another, let it be pills. The important thing is to keep following the patient and following the blood pressure."

"The aim," added Dr. Gifford, "should be to keep the blood pressure under control throughout the day, with as few annoying side effects as possible so the patient won't stop medication." Here is where some doctors find grounds for resisting aggressive treatment of mild to moderate asymptomatic hypertension. They subscribe to the statement made by Dr. W. S. Peart of London in his section on arterial hypertension in the 13th edition of the *Cecil-Loeb Textbook of Medicine*: "Make sure . . . that the treatment by drugs is not going to cause more trouble than the underlying condition." In concluding the section, Dr. Peart observed, "The patient with diarrhea, impotence, tiredness, and a normal arterial pressure is not a therapeutic triumph. To treat hypertensive subjects requires patience, perseverance, optimism, and a belief that the drugs can be manipulated in most cases to lower the arterial pressure while keeping the patient comfortable."

The more than half a hundred antihypertensive agents fall into three broad classes: diuretics that deplete body fluids and sodium, compounds that act on the arterioles to reduce peripheral resistance, and drugs that work by de-

pressing the sympathetic nervous system. Most experts agree that the first line of attack should be the diuretics, since many patients can be managed on them alone.

Specialists tend to have their individual favorites. Says Dr. Gifford: "I still stick by the old thiazide group—it makes little difference which ones you choose—in spite of the fact that they produce hypokalemia and hyperuricemia in some patients." Dr. Finnerty finds patient compliance is improved by a one-pill-a-day regimen and starts with a long-acting diuretic, chlorthalidone. Whatever the diuretic, the experts advise that one should continue to be part of every antihypertensive regimen, not only because of its own effect but because it augments the action of other agents and prevents them from losing their potency.

If additional fire-power besides diuretics is needed, four drugs or combinations of them are used most widely: hydralazine, which acts directly on the arterioles; and reserpine, methyldopa, and guanethidine, all three of which act on the sympathetic nervous system. The last named is usually reserved for patients with moderate to severe hypertension that does not respond to less potent drugs.

The stepped-care regimen proposed by the national program's advisory committee includes a thiazide-type diuretic as the first step; a choice among reserpine, methyldopa, and hydralazine as the second step; a combination of

reserpine-hydralazine or methyldopa-hydralazine (but not reserpine-methyldopa) as the third step; and guanethidine as the fourth. It is recommended that the diuretic be continued throughout therapy. The regimen's objective is to reduce diastolic pressure below 90 mm Hg or, if this leads to too many side effects, below 100 mm Hg.

Not included in these more or less official recommendations is another compound that is widely used in Europe for mild to moderate hypertension and is being increasingly used in the U.S.—propranolol. This beta-adrenergic blocking agent is now on the market for treating arrhythmias but hasn't yet been approved by the FDA for hypertension. It has nonetheless received the de facto approval of many specialists, some of whom criticize what they consider FDA foot-dragging on not only propranolol but also three other experimental agents.

These possible drugs of the future include bethanidine, whose action is similar to guanethidine; guanacydine; and minoxidil. The last two act like hydralazine as peripheral vasodilators, but they are much more potent. The three investigational agents and propranolol are being evaluated in controlled trials by the VA as well as by other investigators. Dr. Freis regards minoxidil as especially promising for treating patients with renal failure and severe resistant hypertension. "Some patients have responded so well," he says, "that we have been able to avoid putting them on hemodialysis." In addition, he has found that diazoxide, still awaiting FDA approval after many years of testing, is effective in treating hypertensive crises.

The NHBPEP is backed up by hundreds of investigators around the country who are seeking clues to the disease's etiology, elucidating its biochemical mechanisms, and paving the way for improved therapy. The cash that flows through the research arteries is derived largely from the NHLI and the American Heart Association. NHLI's proposed research budget for hypertension in the 1974 fiscal year is \$26.5 million, an increase of nearly \$2 million over the previous year. Among the projects is the relatively new SCORE program, an acronym for Specialized Centers of Research. Five of them specialize in hypertension and are located at Columbia University under Dr. Laragh, at Vanderbilt University under Dr. John H. Foster, at the University of Tennessee under Dr. Ernest E. Muirhead, at Indiana University under Dr. James T. Higgins, and at Harvard under Dr. A. Clifford Barger.

Despite the massive organizing effort, the NHBPEP is inevitably more tortoise than hare. Results are expected to be gradual and cumulative. "It will take several years to see a public health effect on morbidity and mortality rates," says Dr. Cooper.

Among the essentials, he emphasizes, is reaching future physicians as well as those now practicing "who were taught many years ago and who may have less access to newer information than their younger colleagues. The priority being given to this problem by the AMA and the National Medical Association should be very helpful.

"As for the potential 23 million patients," he adds, "we can't hope that all of them will soon be converted to perfect management and compliance. But simply bringing in 10% more each year would make a huge difference." ■